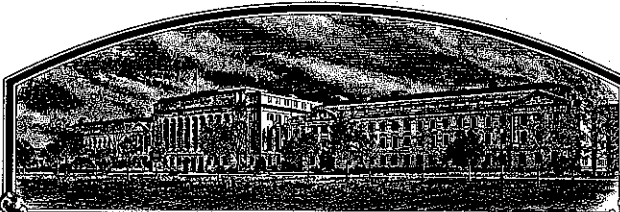


No.

9000169



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

## University of Illinois

Whereas, THERE HAS BEEN PRESENTED TO THE  
**Secretary of Agriculture**

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREBY ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS BY THE OWNER OF THE RIGHTS. (34 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

SOYBEAN

'Kunitz'

In Testimony Whereof, I have hereunto set  
my hand and caused the seal of the Plant  
Variety Protection Office to be affixed  
at the City of Washington, D.C.  
this *28th* day of February in  
the year of our Lord one thousand nine  
hundred and ninety-two.

Attest:

*Kenneth Howard*

Commissioner

Plant Variety Protection Office  
Agricultural Marketing Service

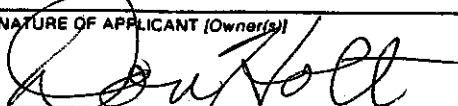
*Edward Madison*  
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE

# APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

<b>1. NAME OF APPLICANT(S) (as if it is to appear on the Certificate)</b> University of Illinois		<b>2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.</b> L81-4590	<b>3. VARIETY NAME</b> Kunitz
<b>4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP)</b> 211 Mumford Hall 1301 W. Gregory Urbana, IL 61801		<b>5. PHONE (include area code)</b> 217-333-0240	
<b>6. GENUS AND SPECIES NAME</b> Glycine max (L.) Merr.		<b>7. FAMILY NAME (Botanical)</b> Fabaceae	
<b>8. CROP KIND NAME (Common Name)</b> soybean		<b>9. DATE OF DETERMINATION</b> December 1989	
<b>10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.)</b> educational institution			
<b>11. IF INCORPORATED, GIVE STATE OF INCORPORATION</b>		<b>12. DATE OF INCORPORATION</b>	
<b>13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS</b> D. A. Holt, Director, Illinois Agricultural Experiment Station 211 Mumford Hall 1301 W. Gregory Urbana, IL 61801			
217-333-0240 PHONE (include area code):			
<b>14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)</b> a. <input checked="" type="checkbox"/> Exhibit A, Origin and Breeding History of the Variety. b. <input checked="" type="checkbox"/> Exhibit B, Novelty Statement. c. <input checked="" type="checkbox"/> Exhibit C, Objective Description of Variety. d. <input checked="" type="checkbox"/> Exhibit D, Additional Description of Variety. e. <input checked="" type="checkbox"/> Exhibit E, Statement of the Basis of Applicant's Ownership. f. <input checked="" type="checkbox"/> Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office _____ g. <input type="checkbox"/> Filing and Examination Fee (\$2,150) made payable to "Treasurer of the United States."			
<b>15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act.)</b> <input checked="" type="checkbox"/> YES (If "YES," answer items 16 and 17 below) <input type="checkbox"/> NO (If "NO," skip to item 18 below)			
<b>16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?</b> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?</b> <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED	
<b>18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?</b> <input type="checkbox"/> YES (If "YES," through <input type="checkbox"/> Plant Variety Protection Act <input type="checkbox"/> Patent Act. Give date: _____) <input checked="" type="checkbox"/> NO			
<b>19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES?</b> <input checked="" type="checkbox"/> YES (If "YES," give names of countries and dates)      U.S. (Dec. 1989) <input type="checkbox"/> NO			
<b>20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.</b> The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act. Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF APPLICANT (Owner(s)) 		CAPACITY OR TITLE Director, AES	
SIGNATURE OF APPLICANT (Owner(s))		CAPACITY OR TITLE	
DATE May 1, 1990		DATE May 1, 1990	

## Kunitz soybean

## Exhibit A. Origin and breeding history

Pedigree: Williams 82 (6) x PI 157.440.

Kunitz is a BC5 isoline of Williams 82 developed by backcrossing to Williams 82 to transfer the gene ti for no Kunitz trypsin inhibitor from PI 157.440. Williams or Williams 82 was the female parent in each cross. The breeding steps were as follows:

1977 field: cross-pollinated Williams x PI 157.440

Fall greenhouse (gh): 2 F<sub>1</sub> plants were grown and crossed to Williams

Spring gh.: 10 F<sub>1</sub> BC<sub>1</sub> plants were grown.

Lab: seeds from the F<sub>1</sub> plants were tested, and 3 plants were found to be Ti ti

1978 field: 3 F<sub>2</sub> BC<sub>1</sub> null plants were grown from chipped seeds (i.e. a seed chip was used for the lab analysis the rest of the seed was planted) and crossed to Williams

Fall gh.: 5 F<sub>1</sub> BC<sub>2</sub> plants were grown and crossed to Williams

Lab: seeds from the 5 plants were tested and only 3 plants were Ti ti (the other 2 were apparently selfs)

Spring gh.: 9 F<sub>1</sub> BC<sub>3</sub> plants grown and crossed to Williams 82

Lab: seeds from the 9 plants were tested and 5 plants were found to be Ti ti

1979 field: 49 F<sub>1</sub> BC<sub>4</sub> plants were grown, 19 from Ti ti parent

Lab: 4 of the 19 were Ti ti

Fall gh.: grew 4 F<sub>2</sub> null plants (ti ti) from chipped seeds from 3 of the Ti ti F<sub>1</sub> plants and crossed to Williams 82

Spring gh.: grew 20 Ti ti F<sub>1</sub> BC<sub>5</sub> plants

Lab: verified that the 20 were Ti ti

1980 field: F<sub>2</sub> BC<sub>5</sub>: grew 20 F<sub>1</sub> plant progeny rows and harvested about 6 plants each for a total of 126 F<sub>2</sub> plants (12 plants were taken from one row which looked most Williams-like and Kunitz is the progeny of one of these)

Lab: Tested seeds from 126 F<sub>2</sub> plants and found 15 nulls (ti ti)

1981 F<sub>3</sub> BC<sub>5</sub>: 15 supposed ti ti F<sub>3</sub> lines grown in 1-row plots and 11 most Williams-like were selected and harvested

1982 F<sub>4</sub> BC<sub>5</sub>: 11 lines tested in replicated yield tests in 2 fields at Urbana.

Lab: tested the 11 lines and found 3 all Ti-a Ti-a, 1 segregating, and 7 all ti ti.

1983 F<sub>5</sub> BC<sub>5</sub>: 7 ti ti lines tested in replicated yield tests in 2 fields at Urbana and 3 in southern Illinois. 2 of the lines tended to shatter and 3 were segregating for phytophthora resistance. Of the remaining 2 lines L81-4590 was selected as most like Williams 82

1984, 1985 and 1988 L81-4590 field tested (8-reps in 1984, 2 in 1985, 2 in 1988) at Urbana with Williams and Williams 82

1985 L81-4590 released as germplasm for experimental use by USDA-ARS and Illinois Agricultural Experiment Station along with ti isolines of Amsoy 71 and Clark 63 and Ti-b and Ti-c trypsin inhibitor variants in backcross isolines of Williams.

1986 to 1989 Feeding trials with poultry and swine were conducted in the Department of Animal Sciences, University of Illinois. L81-4590 demonstrated commercial potential in swine finishing rations.

1989 L81-4590 released for commercial production under the name Kunitz.

Kunitz appears stable and uniform for seed composition and visible plant characteristics through five generations of selfing and during seed increase program.

## Kunitz Soybean

## Exhibit B: Novelty Statement

Kunitz is nearly isogenic to Williams 82. It differs from Williams 82 and all other U.S. commercial varieties in lacking the Kunitz trypsin inhibitor. This trait is controlled by the gene ti. Williams 82 has the allele Ti<sup>a</sup> for the common type of Kunitz trypsin inhibitor. Kunitz differs from three other very similar varieties, Williams, Williams 79, and Winchester in genes controlling phytophthora resistant (Rps genes) in addition to the gene ti. Williams 79, Williams 82, and Winchester were developed by backcrossing to Williams and are nearly isogenic to it except as follows: Williams is rps1 rps3 Ti<sup>a</sup>, Williams 79 is Rps1<sup>c</sup> rps3 Ti<sup>a</sup>, Williams 82 is Rps1<sup>k</sup> rps3 Ti<sup>a</sup>, Winchester is Rps1<sup>b</sup> Rps3 Ti<sup>a</sup>, and Kunitz is Rps1<sup>k</sup> rps3 ti.

## Exhibit E. Basis of Applicant's Ownership

Kunitz was developed at the Illinois Agricultural Experiment Station in the cooperative soybean research program between USDA-ARS and the University of Illinois. R. L. Bernard, an employee of USDA-ARS with a joint appointment with the University of Illinois during the development of Kunitz, and C. R. Cremeens, a USDA-ARS technician, conceived and managed the breeding program, growing the plants, cross pollinating, maintaining pedigree records, and conducting field tests at the Illinois Agricultural Experiment Station. All of the laboratory analyses for Kunitz trypsin inhibitor were

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conducted by T. Hymowitz an employee of the University of  
Illinois.

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
LIVESTOCK, MEAT, GRAIN & SEED DIVISION  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MARYLAND 20705

EXHIBIT C  
(Soybean)

OBJECTIVE DESCRIPTION OF VARIETY  
SOYBEAN (*Glycine max*(L.) Merr.

NAME OF APPLICANT(S) University of Illinois	TEMPORARY DESIGNATION L81-4590	VARIETY NAME Kunitz
ADDRESS (Street and No., or R.F.D. No., City, State, and Zip Code) 211 Mumford Hall 1301 W. Gregory Urbana, IL 61801		FOR OFFICIAL USE ONLY PVPO NUMBER 9000169

Choose the appropriate response which characterizes the variety in the features described below. When the number of significant digits in your answer is fewer than the number of boxes provided, place a zero in the first box when number is 9 or less (e.g., ).

## 1. SEED SHAPE:



1 = Spherical (L/W, L/T, and T/W ratios =  $< 1.2$ )  
3 = Elongate (L/T ratio  $> 1.2$ ; T/W =  $< 1.2$ )

2 = Spherical Flattened (L/W ratio  $> 1.2$ ; L/T ratio =  $< 1.2$ )  
4 = Elongate Flattened (L/T ratio  $> 1.2$ ; T/W  $> 1.2$ )

## 2. SEED COAT COLOR: (Mature Seed)

1 = Yellow      2 = Green      3 = Brown      4 = Black      5 = Other (Specify) \_\_\_\_\_

## 3. SEED COAT LUSTER: (Mature Hand Shelled Seed)

1 = Dull ('Corsoy 79'; 'Braxton')      2 = Shiny ('Nebsoy'; 'Gasoy 17')

## 4. SEED SIZE: (Mature Seed)

Grams per 100 seeds

## 5. HILUM COLOR: (Mature Seed)

1 = Buff      2 = Yellow      3 = Brown      4 = Gray      5 = Imperfect Black      6 = Black      7 = Other (Specify) \_\_\_\_\_

## 6. COTYLEDON COLOR: (Mature Seed)

1 = Yellow      2 = Green

## 7. SEED PROTEIN PEROXIDASE ACTIVITY:

1 = Low      2 = High

## 8. SEED PROTEIN ELECTROPHORETIC BAND:

1 = Type A (SP1<sup>a</sup>)      2 = Type B (SP1<sup>b</sup>)

## 9. HYPOCOTYL COLOR:

1 = Green only ('Evans'; 'Davis')      2 = Green with bronze band below cotyledons ('Woodworth'; 'Tracy')  
3 = Light Purple below cotyledons ('Beeson'; 'Pickett 71')  
4 = Dark Purple extending to unifoliate leaves ('Hodgson'; 'Coker Hampton 266A')

## 10. LEAFLET SHAPE:

1 = Lanceolate      2 = Oval      3 = Ovate      4 = Other (Specify) \_\_\_\_\_



## 11. LEAFLET SIZE:

☒ 21 = Small ('Amsoy 71'; 'A5312')  
3 = Large ('Crawford'; 'Tracy')

2 = Medium ('Corsoy 79'; 'Gasoy 17')

## 12. LEAF COLOR:

☒ 21 = Light Green ('Weber'; 'York')  
3 = Dark Green ('Gnome'; 'Tracy')

2 = Medium Green ('Corsoy 79'; 'Braxton')

## 13. FLOWER COLOR:

☒ 1

1 = White

2 = Purple

3 = White with purple throat

## 14. POD COLOR:

☒ 1

1 = Tan

2 = Brown

3 = Black

## 15. PLANT PUBESCENCE COLOR:

☒ 2

1 = Gray

2 = Brown (Tawny)

## 16. PLANT TYPES:

☒ 21 = Slender ('Essex'; 'Amsoy 71')  
3 = Bushy ('Gnome'; 'Govan')

2 = Intermediate ('Amcor'; 'Braxton')

17. PLANT ~~HAIR~~ STEM TERMINATION:☒ 3

1 = Determinate ('Gnome'; 'Braxton')

2 = Semi-Determinate ('Will')

3 = Indeterminate ('Nebsoy'; 'Improved Pelican')

## 18. MATURITY GROUP:

☒ 06

1 = 000

2 = 00

3 = 0

4 = I

5 = II

6 = III

7 = IV

8 = V

9 = VI

10 = VII

11 = VIII

12 = IX

13 = X

## 19. DISEASE REACTION: (Enter 0 = Not Tested; 1 = Susceptible; 2 = Resistant)

## BACTERIAL DISEASES:

☒ 2Bacterial Pustule (*Xanthomonas phaseoli* var. *sojensis*)☒ 0Bacterial Blight (*Pseudomonas glycinea*)☒ 0Wildfire (*Pseudomonas tabaci*)

## FUNGAL DISEASES:

☒ 1Brown Spot (*Septoria glycines*)Frogeye Leaf Spot (*Cercospora sojina*)☒ 0

Race 1

☒ 0

Race 2

☒ 0

Race 3

☒ 0

Race 4

☒ 0

Race 5

☐

Other (Specify)

☒ 0Target Spot (*Corynespora cassiicola*)☒ 1Downy Mildew (*Peronospora trifoliorum* var. *manshurica*)☒ 2Powdery Mildew (*Microsphaera diffusa*)☒ 1Brown Stem Rot (*Cephalosporium gregatum*)☒ 0Stem Canker (*Diaporthe phaseolorum* var. *caulivora*)

## 19. DISEASE REACTION: (Enter 0 = Not Tested; 1 = Susceptible; 2 = Resistant) (Continued)

## FUNGAL DISEASES: (Continued)

<input checked="checked" type="checkbox"/> 1	Pod and Stem Blight ( <i>Diaporthe phaseolorum</i> var. <i>sojae</i> )												
<input checked="checked" type="checkbox"/> 1	Purple Seed Stain ( <i>Cercospora kikuchii</i> )												
<input checked="checked" type="checkbox"/> 0	Rhizoctonia Root Rot ( <i>Rhizoctonia solani</i> )												
Phytophthora Rot ( <i>Phytophthora megasperma</i> var. <i>sojae</i> )													
<input checked="checked" type="checkbox"/> 2	Race 1	<input checked="checked" type="checkbox"/> 2	Race 2	<input checked="checked" type="checkbox"/> 2	Race 3	<input checked="checked" type="checkbox"/> 2	Race 4	<input checked="checked" type="checkbox"/> 2	Race 5	<input checked="checked" type="checkbox"/> 2	Race 6	<input checked="checked" type="checkbox"/> 2	Race 7
<input checked="checked" type="checkbox"/> 2	Race 8	<input checked="checked" type="checkbox"/> 2	Race 9	<input checked="checked" type="checkbox"/> 2	Other (Specify)	10, 13, 14, 15							
				<input checked="checked" type="checkbox"/> 1	12, 16								

## VIRAL DISEASES:

<input checked="checked" type="checkbox"/> 0	Bud Blight (Tobacco Ringspot Virus)
<input checked="checked" type="checkbox"/> 0	Yellow Mosaic (Bean Yellow Mosaic Virus)
<input checked="checked" type="checkbox"/> 0	Cowpea Mosaic (Cowpea Chlorotic Virus)
<input checked="checked" type="checkbox"/> 0	Pod Mottle (Bean Pod Mottle Virus)
<input checked="checked" type="checkbox"/> 1	Seed Mottle (Soybean Mosaic Virus)

## NEMATODE DISEASES:

Soybean Cyst Nematode ( <i>Heterodera glycines</i> )									
<input checked="checked" type="checkbox"/> 0	Race 1	<input checked="checked" type="checkbox"/> 0	Race 2	<input checked="checked" type="checkbox"/> 1	Race 3	<input checked="checked" type="checkbox"/> 1	Race 4	<input type="checkbox"/>	Other (Specify)
<input checked="checked" type="checkbox"/> 0	Lance Nematode ( <i>Hoplolaimus Colonus</i> )								
<input checked="checked" type="checkbox"/> 0	Southern Root Knot Nematode ( <i>Meloidogyne incognita</i> )								
<input checked="checked" type="checkbox"/> 0	Northern Root Knot Nematode ( <i>Meloidogyne Hapla</i> )								
<input checked="checked" type="checkbox"/> 0	Peanut Root Knot Nematode ( <i>Meloidogyne arenaria</i> )								
<input checked="checked" type="checkbox"/> 0	Reniform Nematode ( <i>Rotylenchulus reniformis</i> )								
<input type="checkbox"/>	OTHER DISEASE NOT ON FORM (Specify):								

## 20. PHYSIOLOGICAL RESPONSES: (Enter 0 = Not Tested; 1 = Susceptible; 2 = Resistant)

<input checked="checked" type="checkbox"/> 0	Iron Chlorosis on Calcareous Soil
<input type="checkbox"/>	Other (Specify)

## 21. INSECT REACTION: (Enter 0 = Not Tested; 1 = Susceptible; 2 = Resistant)

<input checked="checked" type="checkbox"/> 0	Mexican Bean Beetle ( <i>Epilachna varivestis</i> )
<input checked="checked" type="checkbox"/> 2	Potato Leaf Hopper ( <i>Empoasca fabae</i> )
<input type="checkbox"/>	Other (Specify)

## 22. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED.

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant Shape	Williams 82	Seed Coat Luster	Williams 82
Leaf Shape	"	Seed Size	"
Leaf Color	"	Seed Shape	"
Leaf Size	"	Seedling Pigmentation	"

## 23. GIVE DATA FOR SUBMITTED AND SIMILAR STANDARD VARIETY: Paired Comparison Data

VARIETY	NO. OF DAYS MATURITY	PLANT LODGING SCORE	CM PLANT HEIGHT	LEAFLET SIZE		SEED CONTENT		SEED SIZE G/100 SEEDS	NO. SEEDS/POD
				CM Width	CM Length	% Protein	% Oil		
Submitted	131	1.7	98	*	*	42.2	20.0	17.2	*
Name of Similar Variety	130	2.6	98	*	*	41.0	20.3	16.5	*

## PUBLICATIONS USEFUL AS REFERENCE AIDS FOR COMPLETING THIS FORM:

1. Caldwell, B.E., ed. 1973. Soybeans: Improvement, Production, and Uses. Amer. Soc. Agron. Monograph No. 16.
2. Buttery, B.R. and R.I. Buzzell. 1968. Peroxidase activity in seeds of soybean varieties. Crop Sci., 8: 722-725.
3. Hymowitz, T. 1973. Electrophoretic analysis of SBTI-A<sub>2</sub> in the USDA soybean germplasm collection. Crop Sci., 13: 420-421.
4. Payne, R.C. and L.F. Morris. 1976. Differentiation of soybean cultivars by seedling pigmentation patterns. J. Seed Technol. 1: 1-19.

\* These traits all appear to be indistinguishable from Williams or Williams 82.

## Exhibit D, Additional Description of Kunitz Soybean Variety

Kunitz lacks the Kunitz trypsin inhibitor protein in its seeds. All other commercial varieties in the US contain this protein.

